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ORIGINAL ARTICLE

Outcome Assessment after Closed Reduction of Unilateral Mandibular Condylar Fractures

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ABSTRACT

Background: Condylar fractures are classified according to location and treatment planning depends on fracture type, age of patient and surgeons' precedence. Closed reduction has been a common treatment, mainly for unilateral fractures, because it is noninvasive and eventually maintains viable mandibular function with less complications.

Objective: To determine the outcome of closed reduction of mandibular condylar fractures in terms of mean change in mouth opening and occlusion.

Material and Methods: The descriptive cross-sectional study was conducted in the Oral and Maxillofacial Surgery Department from October 2022 to March 2023. Total 80 Patients were included in the study. Preoperative X- rays PA Mandible and Orthopantomogram (OPG) were done to confirm the condylar fractures. Preoperative mouth opening could be recorded by a measuring scale as an interincisal distance between 11& 31 (FDI system). If these were missing, then 12 and 32(FDI system) were considered. Traumatic occlusions were recorded by photographs from front, right and left lateral after sufficient retraction. Patients included in the study were follow-up every week up to 4 weeks. After 4 weeks, elastics were removed. Post treatment mouth opening was recorded. Occlusion was recorded by photographs. Data was entered and analyzed on SPSS V 25.

Results: Mean mouth opening pre-operatively and after 3 month post-operatively was 22.88±3.09mm. and 35.31±3.39mm. Mean change in mouth opening was 12.42±1.71mm. Among patients 56(70%) had good perceived occlusion. Patients whose perceived occlusion amongst them 18(75%) patients had moderate and 6(25%) had poor perceived occlusion.

Conclusion: Results of this study demonstrate that mandibular condylar fractures can be treated effectively with closed reduction with better mouth opening and good occlusion respectively

Keywords: Outcome, Closed reduction, Mandibular Condylar fractures, mean mouth opening and occlusion, mandibular fractures.

INTRODUCTION

Fractures of the mandible are frequently encountered in maxillofacial trauma (57%).[1] Among the other mandibular fractures condylar fractures represents (18-57%) of fractures,[2] of which almost 80% are unilateral. Condylar fractures occur commonly between 20 - 39 years of age with female to male predilection of 1:3. Condylar fractures are due to impact of indirect forces transmitted by a direct chin blows 5 or to the lateral side of mandible by road traffic accidents,[3] assaults, falls, sports injuries and interpersonal violence. There are various classification systems of condylar fractures devised by several authors. Intracapsular fractures are the fractures of the condylar head which are contained totally into the TMJ capsule. Extracapsular fractures include sub condylar fractures and the fractures of the neck of the condyles.[4,5]

If the fracture line runs at the level of sigmoid notch up to the posterior border of mandible it is called sub condylar fracture 3 described by Lindahl, whereas fracture line passing at or above the lowest point of sigmoid notch denotes the fracture of the condylar neck as described by Ellis.[6] These fractures can be deviated, displaced or dislocated depending upon severity of injury. Treatment of condylar fracture depends on various factors including level and extent of fracture, age of the patient, other concomitant mandibular fractures, presence of displacement or dislocation, mandibular function impairment occlusal disturbances and the preference of maxillofacial surgeon.

In previous studies of Pereira et, al.[7], Kocaaslan et, al.[8] closed reduction was favored whereas Shiju Samaira Balouch Haug and Assae[4,9] found both treatment methods effective as in study of Samaria the difference was insignificant. Perceived occlusion was good in 73%, pre and post maximal mouth opening was 35.73 ±4.6mm and 35.20 ±4.1mm. In study of Mukrami et al 45 patients achieved more than 40mm of mouth opening after closed patients of condylar fracture treated with maxillomandibular fixation gained maximal mouth opening. No strong recommendation (of either treatment modality is given till date. Closed reduction has been standard practices for ages.[11,12]

Abe et al analysed unilateral mandibular condyle fractures treated with closed reduction, finding significant differences in age and gender between closed reduction and observation/functional therapy groups. The study revealed that upper fractures tended to heal in a spherical shape, while lower fractures healed in an L-shaped lateral fusion. The average maximum mouth opening post-closed reduction was 42.6mm, with only 21% experiencing post treatment malocclusion. The results provide insight in to the aetiology dysfunction, and healing morphology in these fractures.[13]

Various studies have been performed to decide the treatment of fractured mandibular condyle which is either closed reduction (maxillomandibular fixation) followed by functional therapy or open reduction with or without intimal fixation. The rationale of this study is to assess the outcome of closed reduction of unilateral mandibular condylar fractures in terms of mouth opening and occlusion. And validate best possible non-surgical treatment without undergoing surgical intervention with reduced morbidity and achievement of maximum function and to establish a better treatment option in our setup as very little local literature is available.

MATERIALS AND METHODS

The descriptive cross-sectional study was conducted in the Oral and Maxillofacial Surgery Department from October 2022 to March 2023. Total 82 patients fulfilling the inclusion criteria approved by Ethical Committee were included in the study. Patients aged 16 years or older with diagnosed unilateral mandibular condyle fractures confirmed by preoperative X-rays (PA Mandible and OPG), patients with measurable preoperatively mouth opening, recorded as interincisal distance and also willing to undergo closed

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reduction treatment and follow up were included. Individuals who provided informed consent for the procedure and follow-up as per study protocol. Patients with bilateral condylar fractures or other complex mandibular fractures and pre-existing conditions affecting mouth opening or occlusion and those individuals who had undergone previous surgical interventions for mandibular fractures were excluded. After explanation of the procedure and informed consent all demographic details (name, age and gender), side of condylar process fracture and level of fracture was collected on a prescribed Proforma attached. Preoperative X- rays PA Mandible and Orthopantomogram (OPG) were done to confirm the fracture. Preoperative mouth opening was recorded by a measuring scale as an interincisal distance between 11& 31(FDI system). If these were missing, then 12 and 32 were considered. Traumatic occlusion was recorded by photographs from front, right and left lateral after sufficient retraction. Closed Reduction consisted of placement and stabilization of arch bar after anatomical reduction which was achieve using teeth facets as guide on both arches with guiding elastic for 4 weeks by the researcher herself under the supervision of a consultant having four years' experience in Oral & Maxillofacial surgery. This procedure was done in aseptic conditions after sterile surgical draping. Patients were advised to take liquid diets and maintain good oral hygiene after being discharged on same day. After 4 weeks, the elastics were removed. Post treatment mouth opening was recorded. Occlusion was recorded by photographs. Patients were advised to switch from liquid diet to semi solid diet and do physiotherapy three times a day. Patients were recalled after 3 months for radiography. Measurement of mouth opening was done by scale. Occlusion status was confirmed by asking the patient to categorize the perceived occlusion as good (if normal in chewing and closing) or moderate or poor if worse or any discrepancy found. All data was entered in SPSS 25.0. Quantitative variables such as age and mouth opening were presented as Mean± SD. Qualitative variables such as gender and occlusion were presented in form of frequency & percentages. Chi- square test was applied for perceived occlusion and t-test for mean change in mouth opening with age and gender. A p-value ≤ 0.05 was considered as significant.

RESULTS

In this study total 80 patients were enrolled with Mean age of patients was 28.81±11.12 years with minimum and maximum age of 15 and 60 years. There were 62(77.5%) were male and 18(22.5%) were female. Mean mouth opening pre-operatively was 22.88±3.09mm. Minimum and maximum mouth opening was 18mm and 28mm**.** Mean mouth opening after 3 months postoperative was 35.31±3.39mm. Mean change in mouth opening was 12.42±1.71mm. Table:1

Among patients 56(70%) had good perceived occlusion after closed reduction and physiotherapy. Patients whose perceived occlusion was not good among them 18(75%) patients had moderate and 6(25%) had poor perceived occlusion. No significant difference was seen for mean mouth opening between age groups at 3 months postoperatively. Table:1

Table 1: Mouth Opening

	Mouth Opening		
	Pre-operatively mm	After 3 months mm	Change after 3 months mm
Mean+ SD	22.8+ 3.09	35.31+ 3.39mm	12.42+ 1.71
Perceived Occlusion	Frequency	Percentage	
Good	56	70%	
Moderate	18	22.5	
Poor	6	7.5	

However, patients in the age group 31-45 years had the highest mouth opening as compared to other two age groups. Mean change in mouth opening at 3 months postoperative was significantly higher in male patients as that of female patients respectively. Table: 2 Similarly, Age of patients had no significant impact on perceived occlusion. i.e., p-value=0.869 In the younger age group rate of good occlusion was higher as compared to other age groups. Gender of patients had no significant impact on perceived occlusion. However male patients had higher good perceived occlusion as compared to female patients respectively. Table: 3

Table 2: Mean change in mouth opening with age or gender of the patient

Age Years	N	Mean+ SD	P value
15-30	56	12.37+ 1.67mm	0.69
31-45	16	12.56+ 1.63mm	0.85
46-60	8	12.50+ 2.26mm	0.93
Gender			
Male	62	12.64+ 1.70mm	0.03
Female	18	11.6+ 1.53mm	

Table 3: Perceived Occlusion with gender and age group

Age Years	Perceived Occlusion		P value
	Yes	No	
15-30	40(71.4%)	16(566.7%)	0.86
31-45	11(19.4%)	5(20.8%)	
46-60	5(8.9%)	3(12.5%)	
Gender			
Male	43(76.7%)	19(79.1%)	0.81
Female	13(23.2%)	5(20.83%)	

DISCUSSION

Several treatment approaches have been suggested for managing mandibular condyle fractures, including functional or observational management, open and closed treatment. Functional treatment is recommended for patients with un-displaced fractures and optimal occlusion, involving close monitoring through regular follow-ups and a soft diet during the initial healing phase. While open reduction and internal fixation of condylar fractures typically yield superior outcomes, closed reduction has historically been the preferred approach. This method involves varying durations of maxillomandibular fixation (MMF), followed by intensive physiotherapy.[15]

In this study we assessed the outcome of closed reduction of mandibular condylar fractures in terms of mean change in mouth opening and occlusion. Results showed that Mean change in mouth opening after 3 months postoperative was 12.42±1.71mm. Among patients 56(70%) had good perceived occlusion. Patients whose perceived occlusion was not good among them 18(75%) patients had moderate and 6(25%) had poor perceived occlusion.

According to the results of a local study patients treated with closed reduction among them 17.14% patients had occlusal disturbance. Mean mouth opening with closed reduction was 33.74±4.72mm.[14] However in this study among 30% of patients perceived occlusion was not good who were treated with close reduction and mean mouth opening postoperatively was 35.31±3.39mm respectively. Sudheesh K. M in his study used closed reduction to treat unilateral sub-condylar mandibular fractures. As per his findings 73.3% patients had good perceived occlusion and 23.3% had moderate and 3.3% had poor perceived occlusion.[16] Mean mouth opening at 12th month follow up showed that mean mouth opening was 35.20±4.16. Mean change in mouth opening was 0.53 when compared with pre-operative mouth opening value.[2] However in this study 70% patients had good occlusion, 22.50% had moderate and 7.50% had poor occlusion. In this study mean change in mouth opening pre-operatively after 3 months was 12.42±1.71 respectively. In a study conducted by Nietzen et al(17),16 (24%) of patients perceived their occlusion as "moderate" or "poor." Kotrashetti showed in his study that at 6 month follow up that with closed reduction 91.7% of the patients achieved satisfactory occlusion[18]

The choice1between expected & conservative treatment was guided by the patients' occlusion. Expectant treatment was chosen. When the patient had the potential to achieve maximal

occlusion or when occlusion was only slightly affected. This approach typically involved a soft diet without the use of maxilla mandibular fixation (MMF)., occasionally supplemented by functional therapy with a physiotherapist. Closed treatment with MMF was indicated in case of swelling, deviation during mouth opening, cocurrent mandibular fractures, or pain and restriction in mandibular movements.[19]

In terms of the mechanism behind closed treatment, various theories have been put forward. Ellis and Throckmorton emphasize the need for adaptations on three levels to achieve and maintain normal occlusion: neuromuscular, skeletal and dentoalveolar. Neuromuscular adaptation involves and changes in the way the muscles involved in chewing function, while skeletal adaptation included the regeneration of the condyle and remodeling of the joint[20]

The capacity for condylar remodeling and regeneration becomes compromised and less predictable after dislocation, and this process influenced by age. Once skeletal growth is complete, the condylar cartilage reaches maturity, leading to a general absence of remodeling. In such cases, only functional remodeling may take place. Additionally, fine adjustments in occlusion are achieved through the extrusion of the teeth and or the intrusion of the posterior teeth[21,22]

CONCLUSION AND RECOMMENDATIONS

The conclusion of the study that mandibular condylar fractures can be treated effectively with closed reduction with better mouth opening and good occlusion respectively.

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